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Question Paper Code : 60573

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Fourth Semester

Electrical and Electronics Engineering

EE8451 — LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

(Common to : Electronics and Instrumentation Engineering/Instrumentation and Control Engineering)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is photolithography in IC fabrication and how is it carried out?
2. Give briefly the fabrication of Schottky barrier diode and state why it is prepared over junction diode.
3. With respect to Op Amp state what is CMRR and slew rate?
4. How can an Op Amp be used as a voltage to current converter for grounded load?
5. What is the need to convert a first order filter into a second order filter?
6. How is a peak detector designed with Op Amp?
7. Determine the frequency of oscillation if the duty cycle for an astable 555 multivibrator is $D = 20\%$ and ON period $T_1 = 1 \text{ ms}$.
8. What are capture range, lock range in PLL?
9. What are Quantisation error, analog error in A/D converters?
10. Compare series and shunt voltage regulators.

PART B — (5 × 13 = 65 marks)

11. (a) (i) With neat diagram explain the fabrication of a monolithic transistor.
- (ii) State why NPN transistors are preferred over PNP transistor in ICs. (10+3)

Or

- (b) (i) With neat diagrams explain how integrated capacitors, resistors and diodes obtained in IC fabrication.
- (ii) State how electrical isolation achieved among different. Components fabricated in ICs. (10+3)
12. (a) (i) Derive the gain, input resistance, output resistance of an inverting Op Amp.
- (ii) Assuming slew rate for IC 741 is $0.5 \text{ V}/\mu\text{s}$, what is the maximum undistorted sine wave that can be obtained for 10 V peak and 2 V peak? (7+6)

Or

- (b) (i) With neat diagram derive and explain the circuit of an ideal Integrator.
- (ii) Give the output waveforms of the ideal integrator circuit when the input is sine wave to square wave. (7+6)
13. (a) Consider an inverting Schmitt Trigger circuit using Op Amp. If $R_1 = 56 \text{ k}\Omega$, $R_2 = 200 \Omega$, $v_1 = 1 \text{ V}_{\text{p-p}}$ sine wave of frequency 50 Hz; $V_{\text{ref}} = 0 \text{ V}$ and Op Amp supply voltage is +15 V, -15 V, saturation voltage is $\pm 13 \text{ V}$. Determine the threshold voltage V_{ut} and V_{LT} and plot the input, output waveforms and Hysteresis voltage curve. (13)

Or

- (b) Write briefly on "any two" of the following with neat figures and derivation using Op Amps. (13)
- (i) Negative and positive peak detector circuit.
- (ii) Instrumentation amplifier using transducer bridge.
- (iii) 4 bit R-2R ladder type D/A converter when output voltage range is 0 to 10 V when input binary number is 1010.
14. (a) (i) Give the functional diagram of an Astable multivibrator using IC 555 timer.
- (ii) Design an Astable multivibrator using 555 timer for a frequency of 2 KHz, duty cycle of 70% and assume $C = 0.1 \mu\text{F}$. Find R_A , R_B . (9+4)

Or

- (b) (i) Consider IC 565 PLL to explain the working principle of frequency multiplication/division using it by giving neat block diagram. (7)
- (ii) A PLL IC 565 connected as on FM demodulator has $R_1 = 10 \text{ k}\Omega$; $C_1 = 0.02 \text{ }\mu\text{F}$, $C = 0.04 \text{ }\mu\text{F}$. The supply voltage is $\pm 12 \text{ V}$. Determine the (1) free running frequency (2) Lock range (3) capture range. (7+6)
15. (a) (i) With neat functional block diagram of a high voltage regulator IC 723. (7)
- (ii) Discuss briefly an how to achieve active current limiting circuit for IC 723. (6)

Or

- (b) (i) List any three limitation of linear voltage regulators and (7)
- (ii) Describe how switched mode regulators perform over these limitations, by giving the principle of Bucking Booting switching of switching regulators with suitable diagrams. (6)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Tabulate the differences between Active Filters over Passive filters.
- (ii) With neat diagram describe and derive a first order Low pass Butterworth filter with variable gain and drawing its frequency response.
- (iii) A first order low pass Butterworth active filter has a cut off frequency of 10 KHz and unity gain at low frequency. Find the voltage transfer function magnitude in dB at 20 KHz of the filter. (3 × 5 = 15)

Or

- (b) (i) In inverting mode summary amplifier with Op Amp has inputs as $V_1 = + 2 \text{ V}$; $V_2 = - 3 \text{ V}$; $V_3 = 4 \text{ V}$ and $R_f = R_1 = R_2 = R_3 = 2 \text{ k}\Omega$; the supply voltage $\pm 15 \text{ V}$. Determine the output voltage.
- (ii) Draw and explain the circuit of a positive & negative dual polarity voltage clipper circuit with its waveforms.
- (iii) Explain the functioning of IC LM 78 XX, LM 79 XX for voltage regulation applications. (3 × 5 = 15)

1. The first step in the process of the development of a new product is the identification of a market need.

2. The second step is the selection of a product concept that meets the market need and is feasible to develop.

3. The third step is the development of a product prototype that can be used to test the product concept.

4. The fourth step is the testing of the product prototype to determine if it meets the market need.

5. The fifth step is the development of a marketing plan for the product.

6. The sixth step is the production of the product and its distribution to the market.

7. The seventh step is the evaluation of the product's performance in the market.

8. The eighth step is the modification of the product if necessary.

9. The ninth step is the discontinuation of the product if it is no longer profitable.

10. The tenth step is the evaluation of the product's performance in the market.

11. The eleventh step is the discontinuation of the product if it is no longer profitable.

12. The twelfth step is the evaluation of the product's performance in the market.

13. The thirteenth step is the discontinuation of the product if it is no longer profitable.